



Environmental and Safety Designs, Inc.

901/372-7962

5724 SUMMER TREES DR. • P.O. BOX 341315 • MEMPHIS, TN 38184-1315

May 20, 1992

SITE: Carrier Air
BREAK: 8.4
OTHER: V4

Ms. Beth Brown
Remedial Project Manager
KY/TN Unit, NSMS
Superfund Branch
U.S. Environmental Protection Agency
345 Courtland St.
Atlanta, Ga 30365

Re: Collierville Site Aquifer Pumping Test

Dear Ms. Brown:

Enclosed is a copy of the *East Well Aquifer Pumping Test Work Plan* that we sent by fax to you. Upon EPA approval, we are prepared to begin piezometer construction as soon as 5/27/92. Please call if you have any questions or comments.

Sincerely,

Barton T. Douglas

Barton T. Douglas
Geologist

cc: Nelson Wong - Carrier Corporation
James Mathis, City of Collierville
EnSafe File



10663228

**EAST WELL AQUIFER PUMPING TEST
WORK PLAN
COLLIERVILLE MUNICIPAL WELL FIELD**

**PREPARED FOR:
CARRIER CORPORATION
COLLIERVILLE, TENNESSEE**

**PREPARED BY:
ENSAFE**

MAY 20, 1992

data cranked out mid-Oct.

E-well on 9/23
on 9/26 would have
led, but waited until 9/28.
conversation 9/29
w/ Port Douglas

- Transducers in
APT 1, APT 2, E, W, 14, 6, 58

- Hand-measurements

@ first (dual pumping test) ~ 20 wells, creek (once-a-day)

E-Well Test / Recovery Test

3 days { @ start of test 1/2, 1, 2 for first day
3-4 hours next day
last day 1/2, 2 a day.

1, ③, 4, 10, 12, ③, 16, 43, 61

shows trend, but
could also be due
to barometric
pressure; but
magnitude of Δ
could be due
to unconfined
conditions

↓
can't prove it's affected
barometric pressure
1-2/10' foot
1/10' foot

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ENSAFE

5724 SUMMERTREES DR. MEMPHIS, TN. 38134 (901) 372-7962

FIGURE 1
PROPOSED PIEZOMETER
LOCATIONS
COLLIERVILLE SITE
COLLIERVILLE, TN.

DWG DATE: 06/18/91 DWG NAME: CARST5A

LEGEND

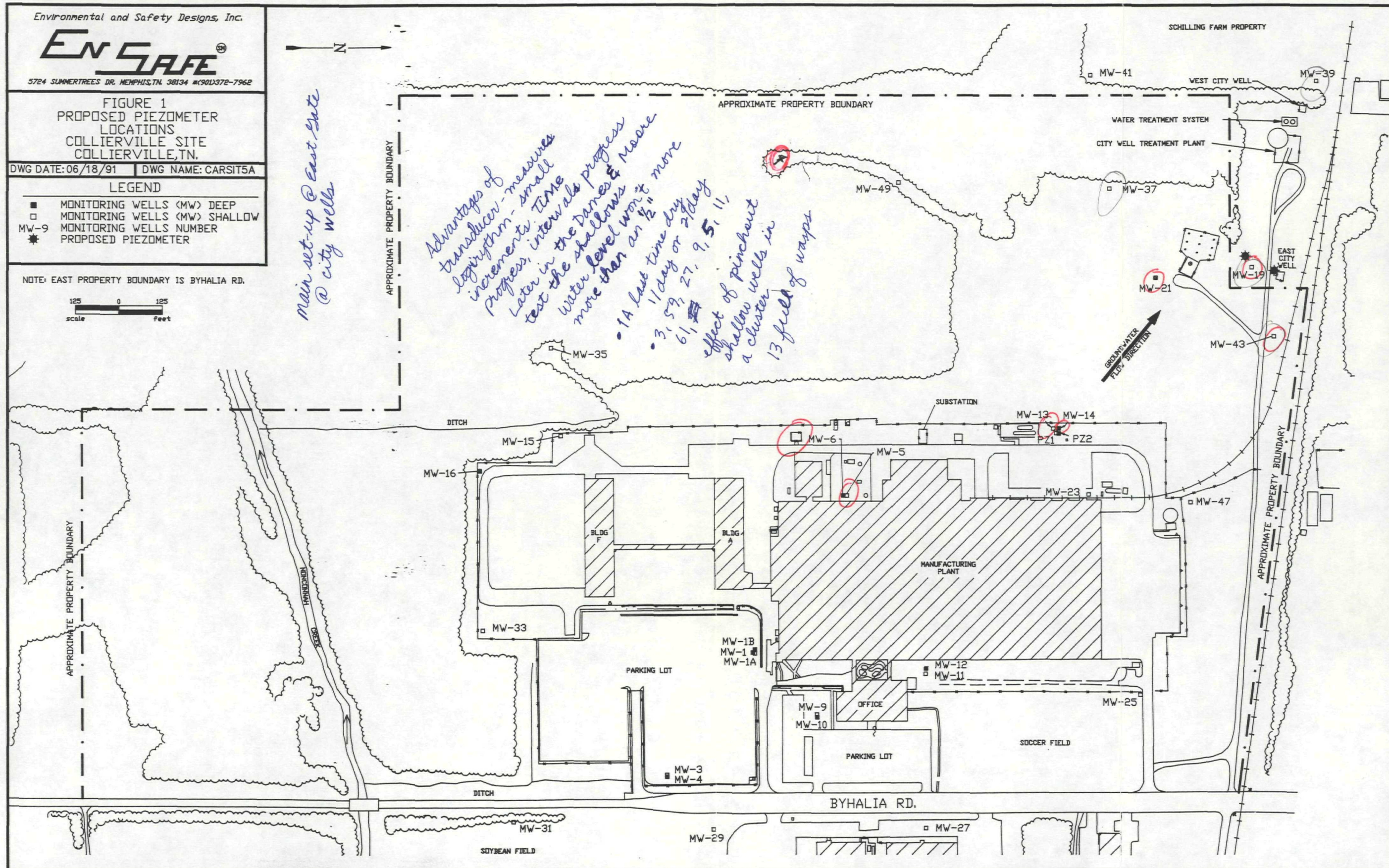
- MONITORING WELLS (MW) DEEP
- MONITORING WELLS (MW) SHALLOW
- MW-9 MONITORING WELLS NUMBER
- ★ PROPOSED PIEZOMETER

NOTE: EAST PROPERTY BOUNDARY IS BYHALIA RD.



*main set-up @ East Gate
@ city wells*

*Advantages of
transducer - measures
logarithm - small
increments, time
progress, intervals progress
later in the day
test the shallows & move
water level won't move
more than an 1/2"
• 1A last time dry
1/1 day or 2 day
3, 5, 9, 27, 9, 5, 11,
61
effect of pinchout
shallow wells in
a cluster
13 feet of wraps*



**19, 37, 39, 43
didn't move
almost sample like*

INTRODUCTION

EnSafe has been retained by Carrier Corporation to design and implement an aquifer pumping test for the Memphis Sand artesian aquifer at the Collierville Municipal Well Field in Collierville, Tennessee. The test will include: (1) installation of two temporary piezometers; (2) monitoring before, during, and after pumping and recovery periods in eight observation wells/piezometers; and (3) continuous barometric pressure monitoring. This test is intended to confirm, append, and/or enhance estimates of aquifer characteristics that were obtained during a previous aquifer test.

During April of 1988, Dames & Moore (D&M) conducted an aquifer pumping test on the west well of the municipal well field. The test involved pumping the west well for 63 hours and monitoring observation wells for three days before and five hours after pumping. A transmissivity of 242,500 gallons per day per foot (gpd/ft) and a storage coefficient between 0.001 and 0.0001 were estimated from test results.

To confirm and refine estimates of aquifer characteristics, EnSafe proposes to repeat the aquifer test with the following changes:

- The duration of pumping will be extended.
- The duration of recovery measurements will be extended.
- Background water levels and barometric pressure will be measured throughout the test.
- Data will be plotted during the test to detect anomalies caused by equipment malfunction.
- Two temporary piezometers will be installed for observation.
- The east well will be pumped for this test.

SCOPE OF WORK

This aquifer pumping test will consist of two or three separate tests involving one pumping period and one or two recovery periods.

Because the city intends to shut down the Collierville field for repairs, the first test conducted will be a recovery test. If the city begins repairing the system before the pumping test equipment can be installed, this first recovery test will not be conducted.

Initially, 72 hours before the recovery test, both the east well and west well will be switched from normal intermittent operation to full-time operation. This is intended to produce a steady state pumping condition in the aquifer prior to the test. When the recovery test is initiated, the pumps will be turned off at the same instant the data loggers begin recording water levels in observation wells. The recovery test will continue for at least 72 hours while the municipal system is under repair.

Once the system is ready for operation, the east well will be pumped at maximum capacity and held at a constant rate for at least 72 hours. The data loggers will be reprogrammed and activated with the pump. When the pump is shut off at the end of the pumping period, another recovery test will be conducted for at least 72 hours. Following this recovery test, the system will return to normal operation.

During each test, water levels in seven observation piezometers/wells will be monitored with pressure transducers and automatic data loggers. Similarly, barometric pressure changes will be monitored with a barometric pressure transducer for the duration of the testing period.

In order to collect pertinent data, two temporary piezometers will be installed during this project. These piezometers will be aligned perpendicular to the direction of groundwater flow (Figure 1). They will be spaced at approximately 25 and 80 feet from the east well in a direction bearing south-southwest.

PIEZOMETER INSTALLATION AND DESIGN

Both hollow-stem auger and mud rotary drilling techniques will be used to install the two piezometers. Initially, a pilot hole will be drilled to the top of the Jackson Clay with 3.25-inch ID augers. Beginning at a depth of 40 feet, split-spoon soil samples will be collected at 10-foot intervals for lithologic characterization.

The pilot hole will be over-drilled with 12.25-inch OD augers to a depth approximately 5 feet below the top of the Jackson Clay. This will allow installation of a 6-inch diameter, schedule 40 PVC surface casing. The surface casing will prevent potential cross contamination between the shallow unconfined aquifer and the Memphis Sand aquifer. A cement/bentonite grout mixture will be tremied in the annulus around the casing to hold it in place.

At least 24 hours after grouting, the borehole will be advanced through the casing with a 3-inch or larger mud rotary bit. A light sodium bentonite mud will be used to provide hydrostatic pressure during drilling. Again, soil samples will be collected at 10-foot intervals for lithologic purposes. The sample interval will be reduced to 5 feet when the Memphis Sand is approached. Sampling will continue to the termination depth approximately 30 feet below the top of the Memphis Sand.

Piezometers consisting of 1-inch diameter, flush-threaded, schedule 40 PVC risers and screens will be installed to the bottom of each borehole. A 20-foot length of 0.010 slot screen will be set from 10 to 30 feet below the bottom of the Jackson Clay.

Natural aquifer materials will be allowed to collapse around the piezometer screen to form the filter pack. Collapse will be enhanced by pumping potable water through the piezometer and into the formation. A 5-foot-thick bentonite pellet seal will be placed at the bottom of the Jackson Clay to prevent leakage. After the bentonite has hydrated for at least eight hours, a cement/bentonite grout mixture will be pumped into the remaining annular space. Auger spoils, drilling mud, and flush water will be collected and stored in 55-gallon drums pending analysis for proper disposal.

For protection and security, a locking steel casing will be placed over the piezometers and cemented in place. The top of each piezometer will be surveyed to the nearest 0.01 foot using a local USGS benchmark.

METHODOLOGY AND EQUIPMENT

Unlike the D&M aquifer test, the east well of the Collierville Municipal Well Field will serve as the pumped well during this test. The east well was selected because it is located closer to most of the selected observation wells. The location is also better because the proposed piezometers can be properly oriented and remain on Carrier property. This allows utilization of the west well as a potential observation well.

The maximum pumping rate for the east well is 500 gallons per minute (gpm). This rate is limited by the size of the pump and the motor that drives it. The cost to install a larger pump cannot be justified within the scope of this project.

An In-situ Inc. pressure transducer will be set in the east well, the two new piezometers, MW-6, MW-14, MW-58, and the west well. Transducers in MW-6 and MW-58 will be monitored with double channel Hermit 1000s. The five other transducers will be monitored with an eight-channel Hermit 2000.

Hand-measuring

Clocks on the data loggers will be synchronized with each other before the first test is initiated. Each Hermit will be programmed to record water levels on logarithmic time intervals. A field printer will be used for plotting data during the tests to detect equipment malfunction.

A barometric pressure transducer will also be connected to the Hermit 2000. Barometric pressure readings will be collected hourly for the duration of the test.

During each test, water levels in selected wells will be monitored on an intermittent basis. For the first eight hours of each test, water levels will be collected on one-hour intervals with a hand-held water level indicator. The interval between measurements will increase to four-hours

after the initial eight-hour period. Data from these intermittent measurements will be used to reveal anomalous values from transducer derived data.

DECONTAMINATION

Transducers and water level indicators will be decontaminated before and after they are placed in the observation wells. ~~Drilling equipment~~ will be steam cleaned and decontaminated before leaving the site. Decontamination will consist of:

- 1) a deionized ^{soap and water} water rinse,
- 2) ~~an~~ isopropyl alcohol rinse; ^{organic-free water}
- 3) ~~and a deionized water rinse~~ ^{SOP APP. B. B. 3}

Decontamination water will be collected at the decontamination pad and disposed of appropriately. Disposal procedures may include the use of the North Remediation System.

- drilling equipment:*
- 1) *soap & water w/steam*
 - 2) *dI*
 - 3) *isopropyl alcohol*
 - 4) *organic water*

*don't need isopropyl
on plastic*